

REMARKS

Claims 1, 3, 4, 6, 9, 11, 13, 14, and 19 are amended.

New claims 28 and 29 are added. Claim 28 parallels claim 1. Accordingly, it is respectfully requested that examination of these claims be permitted in group I.

Claims 26 and 27 are cancelled, without prejudice.

The Office Action

Claim 19 was objected to for informalities.

Claims 3, 4, 9-12, 14, 15, 20, and 21 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention.

Claims 1 and 2 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,552,671 to Parham, et al.

Claims 3 and 4 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,059,865 to Bergman.

Claim 5 was rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,552,671 to Parham, et al., in view of U.S. Patent No. 5,214,345 to Saito, et al.

Claim 11 was rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,552,671 to Parham, et al., in view of U.S. Patent No. 5,646,472 to Horikoshi.

Claim 12 was rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,552,671 to Parham, et al., in view of U.S. Patent No. 5,646,472 to Horikoshi, and further in view of U.S. Patent No. 5,059,865 to Bergman.

Claims 8, 13, and 16-19 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,552,671 to Parham, et al., in view of U.S. Patent No. 5,017,839 to Arlt, et al.

Claims 22-25 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,552,671 to Parham, et al., in view of U.S. Patent No. 5,017,839 to Arlt, et al., and further in view of U.S. Patent No. 5,138,219 to Krisl, et al.

For the reasons outlined below, it is submitted that the claims are in condition for allowance.

The §112 rejections

Claim 3 has been amended to recite that the lamp includes a metal halide

pool and the arc tube is pure or undoped quartz in a vertical orientation and wherein the coating reflects UV radiation such that at least 45% of the UV emitted by the arc in the wavelength range of 300-400 nm reaches the metal halide pool.

Because the reflectance of the coating is so high, very little radiation is absorbed each bounce and thus even with several bounces before reaching the halide pool, a large proportion of the UV radiation reaches the pool.

Claim 4 has been amended to recite determining a region of the lamp where the UV emission is greatest and wherein the coating is optimized by weighting a software program to design the coating so that it has its greatest reflectivity in the region of the UV spectrum where the UV emission from the lamp is greatest. This amendment is supported by page 15, lines 1-12 of the specification. As discussed in this section, the program used to design the coating is preferably weighted to provide the highest reflectivity in those regions of the UV spectrum where the UV emission is greatest.

Claim 9 has been amended to recite determining a mean angle at which UV light strikes the arc tube and, with a computer program which optimizes the coating for a selected angle to the arc tube wall, selecting the angle at which the coating is optimized to be within about 10° of the mean angle.

The Examiner questions how the coating is optimized so that the reflection of UV emission is within about 10 degree of the mean angle. Applicants wish to point out that it is not the reflection angle which is mentioned here but the angle at which the UV light strikes the arc tube, which can be quite different, as illustrated in FIGURE 2. Most of the UV light strikes the arc tube at an angle (represented by θ) which is, on average, off-normal. By taking the mean angle at which the UV light strikes the arc tube into account in generating the parameters of the coating, rather than by assuming a normal incidence distribution, improvements have been found.

The process of optimizing is described in the specification. In particular, the program is fed with the desired characteristics of the coating, e.g., the desired reflectivity/transmittance at each wavelength or wavelength range in the spectrum, the desired angle of incidence of the light upon the coating, the total or maximum number of layers, and a weighting factor, which prescribes the relative importance of each of the desired characteristics. Such programs are capable of dividing the electromagnetic spectrum into a large number of wavelength ranges, and analyzing each one separately. The program then determines the optimum number and thickness of each of the layers for

optimizing the coating to meet the selected parameters.

Claim 14 has been amended to emphasize that the computer program takes the mean angle into account in optimizing the coating.

It is therefore requested that the §112 rejections of claims 9, 10, 14, 15, and 20-21 be withdrawn.

Claim 11 has been amended to recite that the coating is optimized by a computer program which selects an optimum number and thickness of layers of the coating for optimizing the coating to reflect UV light at each of a plurality of wavelengths in direct proportion to the spectral power at each of the plurality of wavelengths.

Amendments to claim 11 are supported by the specification at page 9, line 25, to page 10, line 14. It is submitted that these amendments clarify the optimization.

Accordingly, it is requested that the §112 rejections of claims 11 and 12 be withdrawn.

The §102/103 rejections

Claim 1 recites a method of improving the efficacy of a metal halide lamp which includes disposing a multilayer coating on a surface of an arc tube. The coating is optimized to reflect at least 95% of UV radiation striking the coating.

Parham '671 makes no suggestion of such a method. The Examiner points to col. 4, lines 1-9, which states that "the technique was tailored to block 99% of the total UV radiation emitted by the arc." The Examiner asserts that it is inherent that the coating is optimized to reflect 99% of the radiation. Applicants respectfully traverse.

As noted in column 3, lines 29-33 of Parham '671, "the UV energy traverses the arc tube and is substantially completely absorbed as thermal energy by the coating."

Thus, while Parham reflects "a certain portion" of the UV, there is no suggestion that this portion be at least 95%, as presently claimed. Further, Parham teaches against reflection of a large portion of the UV, in order to minimize the hot spot temperature on the lamp (col. 3, lines 30-33).

Accordingly, it is submitted that claim 1, and claims 2-5 and 8-10 dependent therefrom, distinguish over Parham.

The secondary references cited against claims 3-5 and 8-10 (do not supply the deficiencies of the primary reference. None of these references suggests optimizing a light transmitting film to reflect at least 95% of the UV radiation.

Claim 6, against which no references were raised, has been placed in independent form. Accordingly, it is submitted that claims 6 and 7 are now in condition for allowance.

Claim 11 recites a method for improving the efficiency of a metal halide lamp which includes determining a spectral power distribution for the lamp and disposing a multilayer coating on a surface of an arc tube of the lamp which reflects radiation in the UV region of the electromagnetic spectrum, the coating being optimized by a computer program which selects an optimum number and thickness of layers of the coating for optimizing the coating to reflect UV light at each of a plurality of wavelengths in direct proportion to the spectral power at each of the plurality of wavelengths.

The cited references do not disclose such a method. As the Examiner acknowledges, Parham is silent about the spectral power distribution. Moreover, Parham teaches that it is undesirable to reflect UV light as this results in hot spots.

Horikoshi discloses spectral transmittance characteristics of lamps with various coatings. The Examiner points to column 3, lines 1-20, which indicates that the coating has a light transmittance of 80% or lower in the wavelength range of 350-500 nm. Horikoshi is concerned with the color temperature of the lamp. As illustrated in the FIGURES, this is achieved by influencing the transmission of the coating in the visible range of the spectrum. The transmittance in the UV range is thus largely ignored, as evidenced by the FIGURES. There is no mention in Horikoshi of measuring the spectral power distribution of the lamps and optimizing the coating for UV reflection in proportion to the spectral power. Rather, Horikoshi simply blocks transmission over a broad wavelength range in order to change the color temperature.

As noted in the present specification, the spectral power distribution of an uncoated QMH lamp is shown in Table 1. For this particular lamp, the power radiated by the arc increases with increasing wavelength through the UV range. By taking into account the spectral power distribution in optimizing the coating, more emphasis can be placed on those wavelengths where the power is greater, which has been found to provide improved results, not disclosed or suggested by the cited references.

Accordingly, it is submitted that claim 11, and claim 12 dependent therefrom, distinguish patentably and unobviously over the cited references.

Claim 13 recites a method of improving the efficacy of a metal halide lamp which includes disposing a multi-layer coating on a surface of an arc tube which transmits visible radiation. The multi-layer coating is optimized by a computer program at

an angle which is selected to take into account off-normal incidence of the radiation on the arctube during operation of the lamp.

The references do not suggest such a method. As acknowledged by the Examiner, Parham '671 does not indicate any particular angle of optimization. Arlt places a coating 8 of silicon iron oxide and thereabove a layer of zirconium dioxide at the end of a lamp. There is no suggestion that this coating be optimized by a computer program at an angle which is selected to take into account off-normal incidence of the radiation on the arctube. Nor is there any suggestion that this coating transmit visible radiation. Rather, Arlt simply selects the angle at which the coating starts and ends.

Accordingly, it is submitted that claims 13-25 distinguish patentably and unobviously over the cited references.

Respectfully submitted,

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Date



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